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HARVESTING MALTING BARLEY

Bulletin No. 1
July 15th, 1949

PREPARED BY

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University of Saskatchewan

AND ASSOCIATE AUTHORS

PUBLISHED BY

BARLEY Improvement INSTITUTE
•RESEARCH •ECONOMICS
206 GRAIN EXCHANGE BLDG., WINNIPEG
Sponsored by the Brewing and Malting Industries of Canada

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Harvesting Malting Barley

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Limited.

Foreword

THE Barley Improvement Institute was organized by the Brewing and Malting Industries to assist the barley growers in Canada to improve the yield and quality of the barley crop. A cursory survey of the barley industry indicated that there was a tremendous lowering in quality with a resultant loss in price to the growers due to the use of faulty harvesting technique.

The Institute was fortunate in securing the services of Professor E. A. Hardy of the Engineering Department of the University of Saskatchewan to investigate the problem and to prepare this bulletin on "Harvesting Malting Barley." Professor Hardy is one of the outstanding Agricultural Engineers in Canada and has had a wide experience in threshing and combining grain in the barley growing areas in Saskatchewan. The associate authors are men well qualified by their training in the various phases of the industry to assist Professor Hardy in this arduous task.

The Institute, in the publication of this bulletin, believes it is bringing to the barley growers of Canada the very best information possible on this very important subject and trusts it may be of assistance in improving the quality and price.

T. J. HARRISON,
Director.

Harvesting Malting Barley

THE barley growers in Western Canada lose large sums of money each year from faulty harvesting and threshing technique. In 1948, for example, it was estimated that in Western Canada the loss due to this cause amounted to $2,000,000.00. If the average combine threshes 1000 bushels per day and causes peeling and cracking to the extent of more than 5 per cent, it incurs a loss of upwards of $200.00, because it removes the barley from the malting category and places it in the feed grade. This loss of $200.00 is due to the spread in price and malting premium for malting barley over the feed grades.

A survey of the problem indicates that the loss is due to: (1) harvesting at the wrong stage of maturity, (2) faulty methods of swathing, and (3) the use of improper adjustments on the combine and thresher. Many of these faulty practices are the result of an incorrect conception of what constitutes a good malting barley.

Stage of Maturity

One of the most important properties in evaluating the malting quality of barley is maturity. Immature kernels do not convert properly in the malting process. Good malting barley must be plump and well matured. In order to obtain plump, well matured grain, the crop should not be harvested on the "green side" as is, all too frequently, done. This practice originated because of the tendency of many malting varieties to "shatter" or to "neck," particularly if the weather is dry and high winds prevalent. Like many of these practices, the immature harvesting of barley was sometimes carried to the extreme, with considerable loss to the grower. With the introduction of such varieties as Montcalm and Olli, the crop may be allowed to become riper than is the case with some of the other malting varieties.

Good Swathing Practices

Good malting barley should be of a rich golden color. This color can be obtained by proper swathing. The swath should be laid on the stubble in such a way that the heads do not fall through and lie on the ground. The golden color is the result of the action of the dew on the grain. If, however, the head comes in contact with the soil, the grain becomes discolored and frequently damaged by soil moisture. This is intensified if the swath is subjected to rains. Therefore, the combining should be done as soon as the barley is properly dried in the swath. Usually from three days to one week is long enough to leave the barley in the swath.

Good swathing is dependent upon a good stand, seeded in such a way as to provide stubble to support the swath. Barley should be seeded with the one way disc or discer and seed box attachment, or with a drill seeding 6 inch centres.

The drills seeding 7 inch centres do not place the seed so that a light stubble will support the swath so that the heads do not fall through to the ground.

It is important that the width of the swath be adjusted to the weight of the crop being harvested. A heavy crop may be placed in a wide swath, while a light crop must be held together in a narrow swath. The metal shield which presses the stubble forward while the swath is applied upon the stubble should be carefully adjusted. The length of straw should be ample to hold the swath up from the ground, but not so long that the weight of the swath collapses the stubble with the swath resting on the ground.

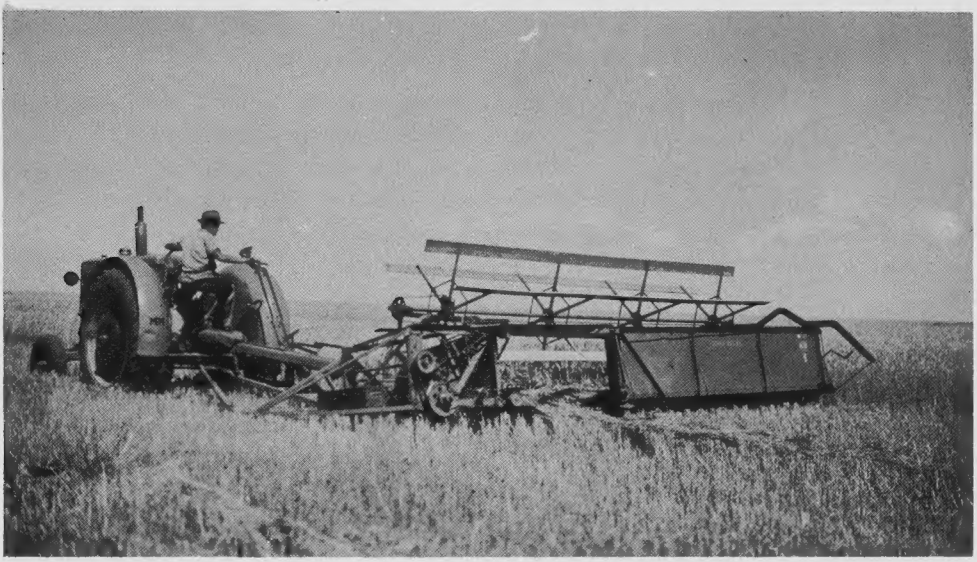


FIGURE 1
Adjusting the height of cut for length of straw when swathing.

When barley has been cut with the binder, the sheaves should be picked up immediately and placed in carefully formed stooks which will stand well and protect the grain from the weather. Damage results from leaving the barley exposed to the weather before stooking.

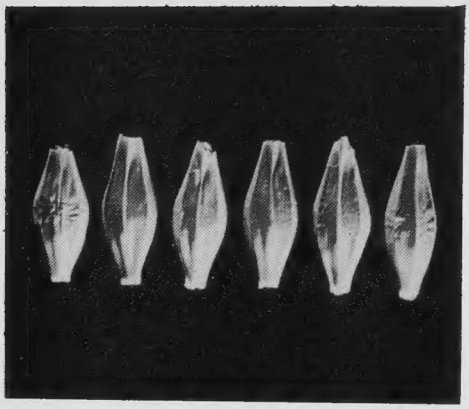
Quality Barley

To produce good malting barley, the kernels must not be broken or peeled in combining, threshing, or subsequent handling. The reason for this is that in the malting process, the barley is "grown" or germinated and if the kernel is broken, it will impair the germination.

When barley is germinating, the shoot or young stem grows back under the hull from the germ end and emerges at the other end of the kernel. To make good malt, the shoot must be protected by the hull. If the kernel is peeled or even partially peeled (closely threshed), the shoot will break off and be lost when the malt is dried and the rootlets removed.

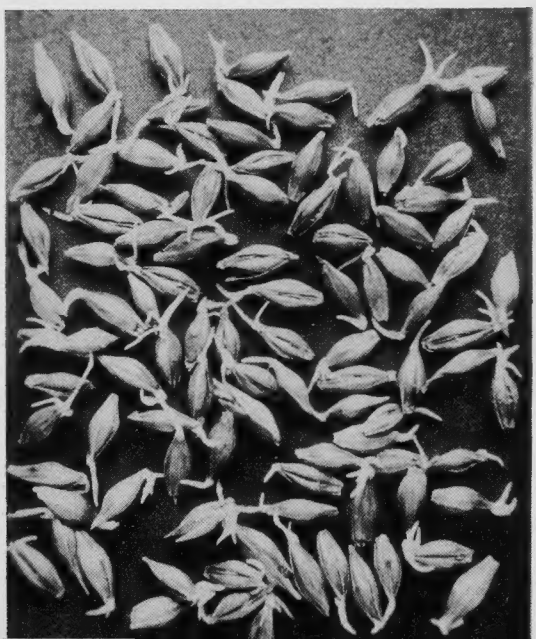
Figure 2

Good Quality Malting Barley



Properly matured, well-threshed kernels.

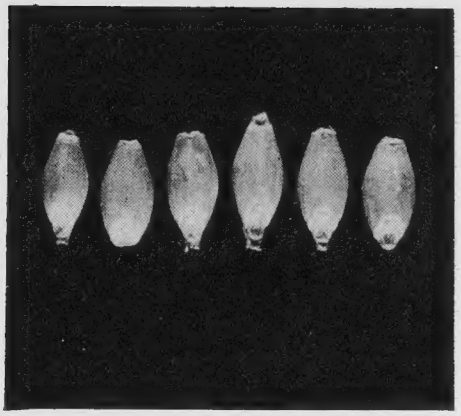
The quality of barley the grower should strive for, grades No. 1 C.W. Six-row. Sells often for as much as 20 Cents per bushel over No. 1 Feed plus the 5 Cents per bushel malting premium.



Good quality malting barley produces a strong, uniform "growth" or germination. This quality of barley will help expand the market for Canadian malt and malting barley.

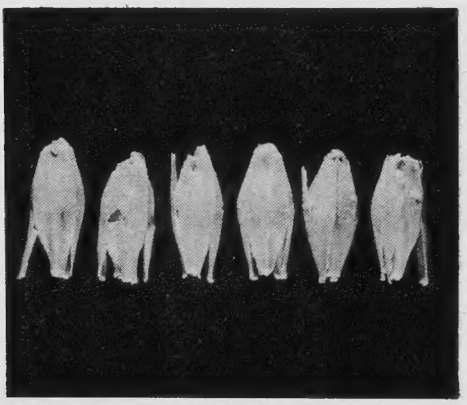
Figure 3

Peeled and Partially Peeled Barley



Peeled kernels; many are injured and will not germinate.

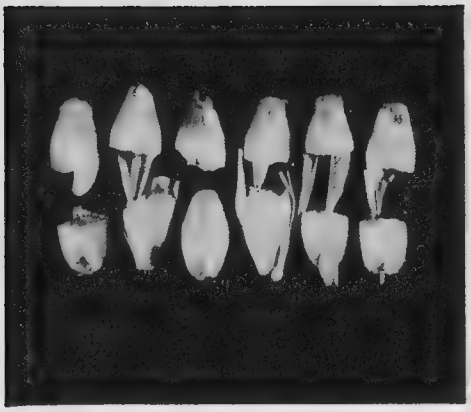
Good malting barley that would have graded No. 1 C.W. Six-row but was damaged in threshing with over 5 per cent. peeled and partially peeled kernels, and actually graded No. 1 Feed.



Partially peeled barley may not germinate and, if it does, the sprout will protrude and be lost.

Figure 4

Broken Barley



Broken kernels—at least one-half of the endosperm end of the kernel cannot germinate and the starch cannot be converted to sugar.

Good malting barley that should have graded No. 2 C.W. Six-row but was damaged in threshing and will grade only No. 1 Feed. There is over 5 per cent. broken or cracked kernels.

Even with a small trace of peeling or close threshing, the ends of the kernels open up and give a "ragged" appearance to the malt and processors may refuse to accept shipment of malt in this condition.

In the commercial grading of barley, 5 per cent peeling is allowed in No. 2 C.W. Six-row and No. 3 C.W. Six-row grades, but even this amount of peeling causes a loss and, if Canada is to establish a good domestic and export market for malt and malting barley, this peeling must be eliminated or at least materially reduced.

While some damage may occur in the handling of barley after threshing, the National Research Council, which investigated this some years ago, reported that if the grain was properly threshed, the handling damage was negligible; but if the grain was damaged in threshing, it got progressively worse each time it was handled. For example: barley, showing only 3 per cent of damaged

Figure 5

Broken, Peeled, and Partially Peeled Barley

Actual sample of good malting barley that should have graded No. 2 C.W. Six-row but was damaged in threshing. Note the 10 per cent. or over of broken, peeled and partially peeled kernels that caused it to be graded No. 1 Feed.

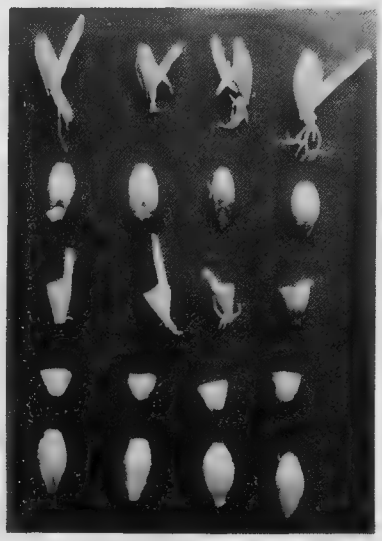
A. Peeled and partially peeled kernels with out-growing sprout.

B. Peeled kernels with dead germs. Useless for malting and a source of injurious molds.

C. Germ end "half corns" with out-growing sprout.

D. Endosperm end "half corns," no sprout. Useless for malting and a source of injurious molds.

E. Dead kernels. Useless for malting and a source of injurious molds.



kernels as it came from the threshing machine, contained 9 per cent of damaged kernels at the final destination.

Well Threshed Barley

Many combine operators and threshermen believe that to make a good job of threshing barley, it must be threshed "close" so that it will weigh heavy per

measured bushel. This is absolutely incorrect. While weight per bushel is important in grading, absence from peeling is much more important. Well threshed malting barley might have about 1/8 of an inch of awn. This is necessary to prevent peeling and to protect the kernel in subsequent handling. Some varieties thresh more easily than others. For example, among the malting varieties—O.A.C.21, Mensury (Ott.60), and Olli thresh better than Montcalm. The awns are more brittle and, therefore, break more easily and the hulls are more firmly attached to the kernel. Montcalm, on the other hand, has a tough awn which tends to break close to the hull and frequently takes part of the hull with it, exposing the kernel and causing a peeled or "ragged" malt. Therefore, while all malting varieties require extreme care in threshing, this is particularly the case with regard to Montcalm.

Barley must not be combined or threshed before the moisture content of the kernel has been reduced by drying in the swath or stook to a level of 14.8 per cent or less. At this level of moisture content, it can be stored safely. If it is threshed or combined with more than this amount of moisture, it will be degraded

FIGURE 6
Picking Up a Well Laid Swath.

to "tough," or if it contains more than 17 per cent moisture, it will be degraded to "damp."

When the kernel is of the right moisture content, best results will be obtained in threshing or combining when the hull is a little tough as a result of the dew. In other words, the best time of day in which to thresh barley is in the early morning or late evening.

Barley may well be picked up from the swath and combined at night so that the straw will be tough. The tough straw will act as a cushion for the dry kernels, preventing damage to the kernels when passing through the cylinder of the thresher or combine.

Feeding the Thresher or Combine

The threshing machine or combine should be fed slowly and evenly in keeping with the reduction in speed of the cylinder. When possible, the grain should be fed through the machine straw-first in order to cushion the threshing of the kernels. It must be remembered that when the cylinder speed is reduced the capacity of the combine is reduced, resulting in the slowing down of the combine in the field. A great deal of barley threshing damage is done by trying to jam a large volume of grain through a cylinder operated at lower speeds than for wheat threshing.

Cylinder Speed

Cylinder speed MUST be reduced on both the threshing machine and the combine if damage-free threshing is to be done. Thresher speeds of 1150 R.P.M. may be reduced to 810 R.P.M., while combine cylinder speed should be reduced from 1080 to 930 R.P.M. The cylinder speeds are quoted to be used as typical but not literal. The speed of the cylinder of any machine should be reduced in the same proportion. Satisfactory work can rarely be done by slowing the engine and the entire machine proportionally. However, with the threshing machine, where inconvenient to slow one part independently, it is possible to slow all of the machine but the shoe and do good work. The shoe should operate at normal speed to do proper separation of the barley from the chaff and straw. The cylinder speed of the combine can quite easily be reduced without affecting the operating speed of the rest of the machine.

Cylinder Teeth or Rub-Bars

Cylinder teeth must be straight and uniform. Slightly worn smooth teeth are desirable. The rubber covered cylinder rub-bar is desirable where available. The ordinary cast or steel rub-bar will thresh without damage to the kernels, however, if operated at the correct speed and adjusted correctly. The peg tooth cylinder should be adjusted so that practically no end play is evident and the same spacing will be available on each side of the teeth.

Concave Adjustments

The concave of the thresher should be fitted with as few rows of teeth as necessary for removing the kernels from the head. One row of teeth is usually sufficient. Two rows may be necessary where the barley is more difficult to thresh. The concave on some of the combines may have every other bar removed so that the concave may have more capacity with less rubbing. The concave adjustment for both the thresher and the combine should be open as far as possible without interfering with the removal of the kernels from the head.

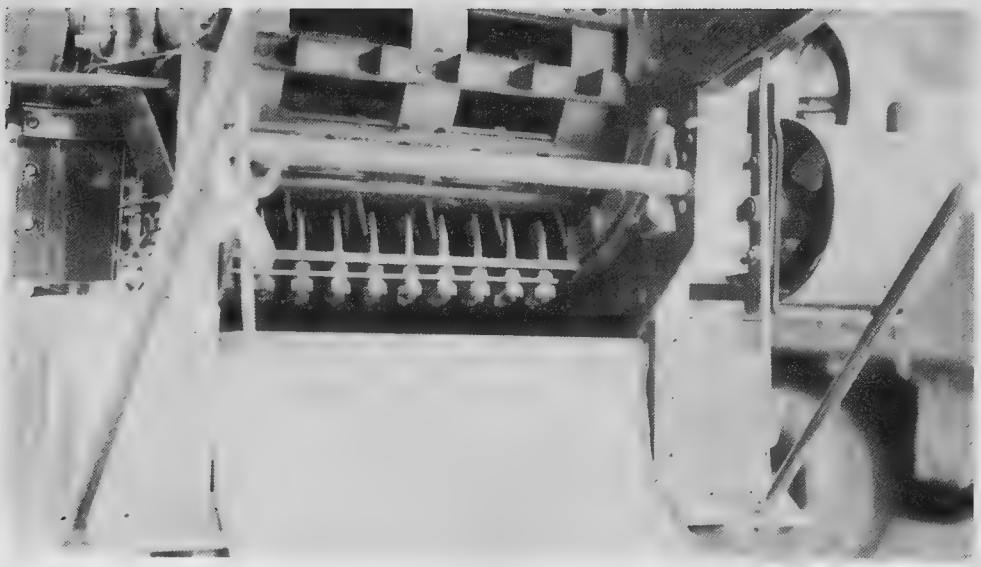


FIGURE 7
Teeth Straight, Concave Adjusted Low.

The combine with the adjustable cylinder should be so adjusted that the cylinder is raised to increase the clearance sufficiently above the clearance for wheat that the barley will be threshed without damage. The cylinder adjustment or concave adjustment should provide even clearance across the width of the combine cylinder.

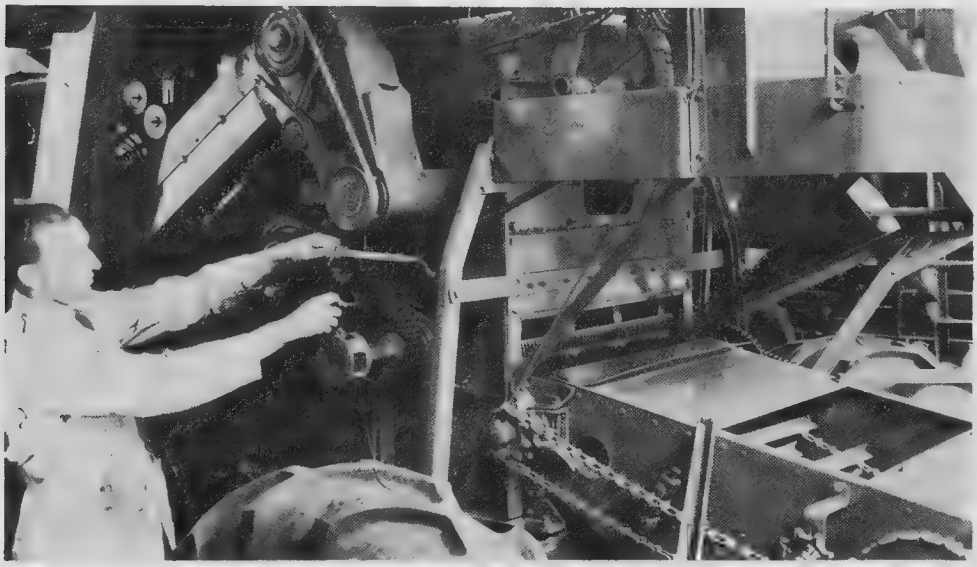


FIGURE 8
Raising Rub-Bar Cylinder of Combine for Threshing Malting Barley.

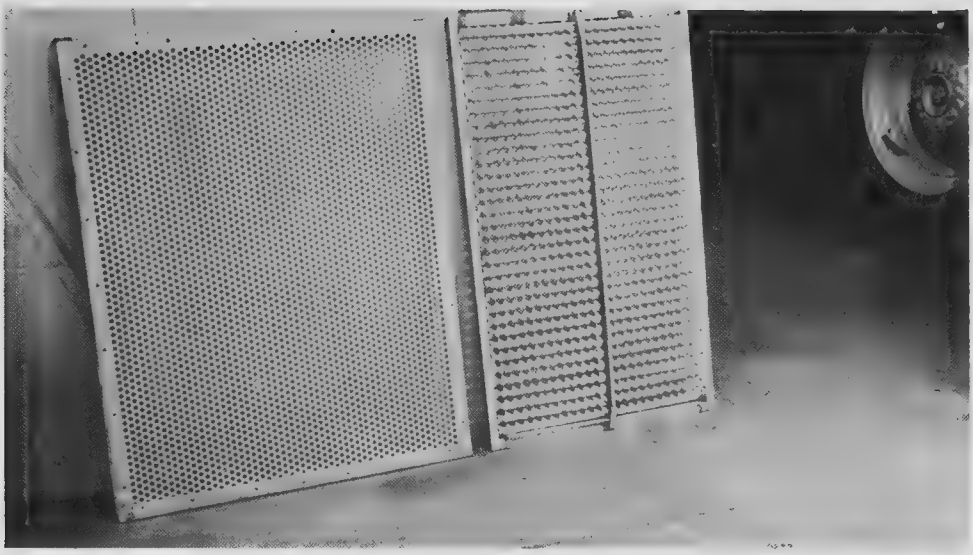


FIGURE 9
Wheat Sieve and Chaffer Too Small for Barley.

Adjustment of Shoe

Malting barley is bulky as it flows back over the chaffer and sieves of the shoe. Both chaffer and sieves need to be open more than for wheat.

Barley sieves should be used in place of the wheat sieve. The barley sieve is larger with at least 5/8 inch round hole, so that the larger kernels, with the 1/8 inch beards, will pass through the sieve. When the barley passes over the

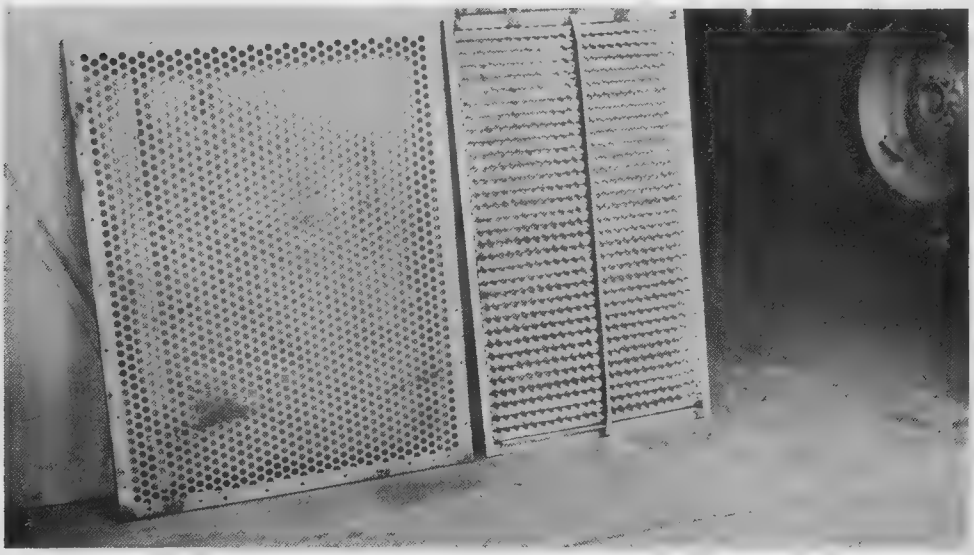


FIGURE 10
Barley Sieve and Chaffer. Note Larger Openings in the Sieve.

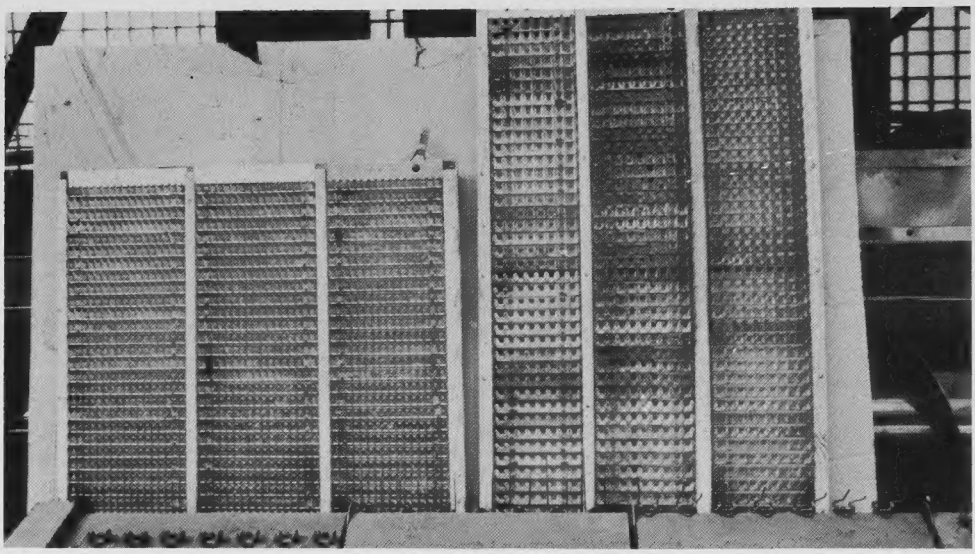


FIGURE 11
Adjustable Lip Sieve and Chaffer.

sieve and into the return in large quantity, cross slats 3/8 inch thick may be placed upon the surface of the barley sieve as retarders with marked results.

A great deal of damage in threshing is due to grain finding its way into the return, which puts it through the cylinder the second time. Everything possible should be done to reduce the grain in the return.

Where the adjustable sieve and chaffer is used, the adjustments must be open as much as possible to encourage the bulky grain to pass through the chaffer

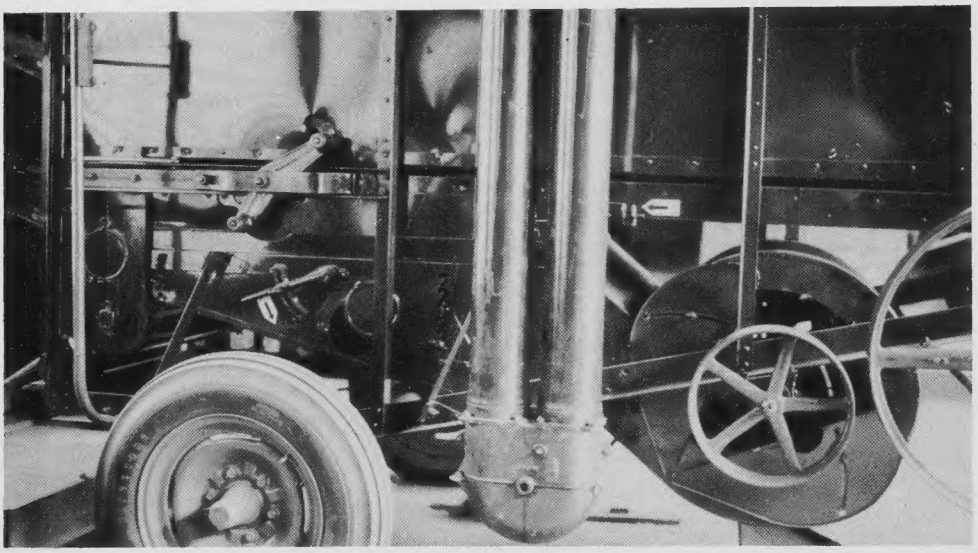


FIGURE 12
Fan and Shoe Adjustments on the Threshing Machine and Combine.

and sieve before reaching the return. The lip sieve and chaffer seem to have more capacity for wind. Sieve adjustments are particularly important.

The wind should be directed to the front of the sieve and chaffer, and be of sufficient volume to separate the kernels with the short beard attached, from the chaff. The sieves should be level in the shoe to encourage rapid flow through the sieves.

The fan and shoe adjustments of the combine are similar to those of the threshing machine. The volume of air should lift the chaff from the grain at the front of the sieve to provide more time for the slow moving plump barley kernels to get through the sieve before being carried over into the tailings and returned to the cylinder.

Use the blast for separation and cleaning and handle malting barley gently all the way through the harvest.

1. Take time to know quality malting barley when you see it.
2. Grow the best variety of malting barley for your soil and climate.
3. Harvest it at the correct time.
4. Take time to adjust the swather.
5. Take time to adjust the combine or threshing machine for quality threshing.
6. Handle the barley carefully from the machine to market.
7. The extra time and attention necessary for growing quality malting barley pays dividends and helps to find and secure wider markets for both malting barley and malt.